ATEC Associates, Inc.

1501 East Main Street • Griffith, Indiana 46319
Griffith Phone (219) 924-6690
Chicago Phone (312) 375-9092

September 13, 1985
File 5-1017

ATEC Offices
Corporate Office:
Indianapolis, IN

Offices:
Atlanta, GA
Baltimore, MD
Birmingham, AL
Chicago, IL
Cincinnati, OH
Dallas, TX
Dayton, OH
Denver, CO
Freeport, TX
Gary, IN
Houston, TX
Huntsville, AL
Lexington, KY
Louisville, KY
Newport, NC
Raleigh, NC
Salisbury, MD
Savannah, GA
Washington, DC
York, PA

Affiliates:
Alexandria, VA
Norfolk, VA

Larry Hogan
Gary Development Sanitary Landfill
Cline & Gary Avenue
Gary, Indiana

REPORT

Soil Boring, Gary Landfill

Dear Mr. Hogan:

We have completed the soil boring on the Gary landfill west wall. The purpose of the work was to explore the thickness of both the clay cover, and the clay liner. Due to standing water at the site, only one boring location could be reached with our truck-mounted drill rig.

Work Summary

Field drilling activities were performed with a truck-mounted CME 55 rotary drill rig. The boring was advanced with a 3.25 inch I.D. Hollow Stem Auger (HSA). Continuous sampling was performed, with a 2 inch O.D. split-spoon sampler beginning at a depth of 5.0 feet. Clay was reached at a depth of 9.0 feet and a Shelby tube sample was taken from 9.0 to 11.5 feet. The remaining depth, 11.5 to 13.0 feet, was split-spoon sampled. The boring was ended at 13.0 feet.

Subsurface Conditions

Our soil boring encountered a clay cover from 0.0 to 2.0 feet. From 2.0 to 9.0 feet, landfill intermixed with gray clay was encountered. Gray silty clay with a trace of sand was observed from a depth of 9.0 to 11.5 feet. From 11.5 to 13.0 feet, gray medium sand was encountered.

LTV Steel Company

LTV

RECEIVED
SEP 4 1985
WDK

August 20, 1985

Mr. Larry Hagen
Gary Land Development Company
P.O. Box 6056
Gary, IN 46406

Dear Mr. Hagen:

Please be advised that there has been no significant change in the analysis of those sludges being sent to Gary Land Development from our Central Treatment Plant and the Titzel Oil Recovery Unit. An effort by the Company to reduce the moisture content has resulted in a reduction in volume.

Very truly yours,

Carl Broman, Supt.
Env. Control Dept.

CB:mh/195

The Shelby tube sample was tested for permeability using the falling head method. The sample has a permeability of 3.3×10^{-8} cm/sec.

We thank you for the opportunity to be of service. If you have any questions, please don't hesitate to call.

Very truly yours,
Atec Associates, Inc.

Steven Stanford
Geologist

John W. Weaver II, P.E.
Vice President

SS:JWW/ls

ATEC Associates, Inc.

15501 E. Main Street, Griffith, IN 46319 • 219-924-6650 • 312-375-9092
13450 S. Cicero Avenue, Crestwood, IL 60445 • 312-388-0595

LOG OF SOIL BORING NO. 1

WATER LEVEL DATA		
____ FT. W.D.	STARTED	9/11/85
____ FT. ____ HR. A.D.	COMPLETED	SAME
____ FT. ____ HR. A.D.	DRILLER	D. Sheffield
____ FT. ____ HR. A.D.	HELPER	J. Baines
	FILE NO.	5-1017

LOCATION: Gary Development Sanitary Landfill
Cline & Gary Ave
Gary, IN

CLIENT: Soil Borings, Gary Landfill
Gary, IN

GROUND ELEVATION:

DEPTH	SOIL DESCRIPTION AND STRATA DEPTH	SAMPLE DATA: TYPE	RECOVERY	NUMBER	UNIT DRY WT. LBS./FT.3
0	Clay cover				
2.0'					
2.5	Landfill and CLAY intermixed				
5.0				1	
				2	
7.5				3	
9.0'					
10.0				4	
	Gray silty CLAY, trace SAND				
11.5'					
	Gray SAND, trace CLAY			5	
12.5	13.0'				
	Boring Ended @ 13.0'				
15.0					
17.5					
20.0					
22.5					
25.0					

UNCONFINED COMPRESSIVE STRENGTH — T.S.F.
1.0 2.0 3.0 4.0 5.0 6.0

PLASTIC LIMIT % WATER CONTENT % LIQUID LIMIT %
10 20 30 40 50 60

STANDARD PENETRATION TEST — "N" VALUES
10 20 30 40 50 60

NOTES:

LEGEND
- SPLIT-SPOON
- AUGER
- SHELBY TUBE
- PISTON
- ROCK CORE
- CALIBRATED PENTROMETER

W.D. = WHILE DRILLING A.D. = AFTER DRILLING

THE "N" VALUES IN THE STANDARD PENETRATION TEST ARE BLOWS PER FOOT REQUIRED TO DRIVE A 2" O.D. SPLIT-SPOON SAMPLER USING A 140 LB. WEIGHT FALLING FREE FOR A DISTANCE OF 30".

ATEC Associates, Inc.

11501 E. Main Street, Griffith, IN 46319 • 219-924-4650 • 312-375-9092
13458 S. Cicero Avenue, Crestwood, IL 60445 • 312-388-0855

PERMEABILITY TEST

CLIENT	PROJECT	
Gary Development Sanitary Landfill Cline & Gary Ave. Gary, IN	Soil Borings Gary Landfill Gary, IN	FILE No. 5-1017 DATE 9/17/85 REPORT No. ____ SHEET ____ OF ____ TECHNICIAN WSG

LAB NO. ____ BORING NO. TB-1 SAMPLE NO. ____ DEPTH 9.5-11.5'

CLASSIFICATION ____

READING NUMBER	Q FLOW (ML)	h_o INITIAL HEAD(CM)	$h_o - h_1$ DROP IN HEAD(CM)	h_1 FINAL HEAD(CM)	INITIAL TIME	FINAL TIME	± TIME (SECONDS)	K PERMEABILITY RATE (CM/SEC)
1	2	90.0	1.3	88.7	3:09PM 9/17/85	8:06AM 9/18/85	61,140	3.3×10^{-8}

AREA OF STANDPIPE (CM^2) $a = 1.733$

LENGTH OF SAMPLE (CM) $L = 2.54$

AREA OF SAMPLE (CM^2) $A = 31.65$

WET DEISITY ____ PCF

$$K = \left(\frac{2.3\,a\,L}{A\,t}\right) \log\frac{Ho}{Hi} = 3.3 \times 10^{-8}\ CM/SEC$$

ATEC Associates, Inc.

1501 East Main Street • Griffith, Indiana 46319
Griffith Phone (219) 924-6690
Chicago Phone (312) 375-9092

November 8, 1985
File 5-1017

Larry Hagan
Gary Development Sanitary Landfill
Cline & Gary Avenue
Gary, Indiana

REPORT
Soil Borings
Gary Development Sanitary Landfill
Gary, Indiana

Dear Mr. Hagan:

We have completed four soil borings on the Gary landfill west wall. The purpose of the work was to obtain samples of the clay liner for permeability testing. Boring locations were specified by you.

Information from our report dated September 13, 1985 is also included, in order for this report to be complete. The previous Boring 1 has been relabeled as B-4.

Work Summary

Field drilling activities were performed with a truck-mounted CME 55 rotary drill rig. The borings were advanced with 3.25 inch I.D. hollow stem augers. A Shelby tube sample was taken from the clay liner at each location. Borings were grouted upon completion.

Subsurface Conditions

In general we encountered a clay cover approximately 2.0 feet thick followed by landfill and clay intermixed. In all borings a gray, silty clay liner was encountered at depths ranging from the surface to approximately 20 feet.

Permeability Testing

Shelby tube samples from each boring were tested for permeability using the falling head method.

Data Summary

Boring	Depth of Sample	Permeability
B-1	20.0' to 22.5'	6.0 x 10-7 cm/sec
B-2	2.0' to 4.5'	2.4 x 10-8 cm/sec
B-3	15.0' to 17.5'	3.0 x 10-7 cm/sec
B-4	9.5' to 11.5'	3.3 x 10-8 cm/sec

We thank you for the opportunity to be of service. If you have any questions, please don't hesitate to call.

Very truly yours,
Atec Associates, Inc.

Steven Stanford
Geologist

Robert J. Grillo, P.E.
Engineering Manager

ATEC Associates, Inc.

[illegible] E. Main Street, Griffith, IN 46319 · 219-924-4699 · 312-375-9592
[illegible] S. Cicero Avenue, Crestwood, IL 60445 · 312-388-0855

PERMEABILITY TEST

CLIENT: Gary Development Sanitary Landfill
Cline Ave. & Gary Ave.
Gary, IN

PROJECT: Soil Borings
Gary Landfill
Gary, IN

FILE No. S-1017
DATE 11/7/85
REPORT No. ____
SHEET 1 OF 1
TECHNICIAN DG

LAB NO. Con-3 BORING NO. B-1 SAMPLE NO. ST-1 DEPTH 20.0' to 22.5'

CLASSIFICATION ____

READING NUMBER	Q FLOW (ML)	h_o INITIAL HEAD(CM)	$h_o - h_1$ DROP IN HEAD(CM)	h_1 FINAL HEAD(CM)	INITIAL TIME	FINAL TIME	± TIME (SECONDS)	K PERMEABILITY RATE (CM/SEC)
1	2	90.0	29.1	88.1	11:29AM 11/7/85	1:09PM		
				84.7		3:30PM		
				60.9		11:29AM 11/8/85	86,400	6.0×10^{-7} cm/sec

AREA OF STANDPIPE (CM^2) $a =$ 1.645

LENGTH OF SAMPLE (CM) $L =$ 2.54

AREA OF SAMPLE (CM^2) $A =$ 31.33

WET DENSITY PCF

$$K = \left(\frac{2.3\,a\,L}{A\,t}\right) \log\frac{Ho}{Hi} = 6.0 \times 10^{-7} \text{ cm/sec}$$

ATEC Associates, Inc.

9501 E. Main Street, Griffith, IN 46319 · 219-924-4650 · 312-375-9097
13450 S. Cicero Avenue, Crestwood, IL 60445 · 312-388-0455

PERMEABILITY TEST

CLIENT: Gary Development Sanitary Landfill
Cline Ave. & Gary Ave.
Gary, IN

PROJECT: Soil Borings
Gary Landfill
Gary, IN

FILE No. 5-1017
DATE 11/7/85
REPORT No. ____
SHEET 1 OF 1
TECHNICIAN DG

LAB NO. Con-1 BORING NO. B-2 SAMPLE NO. ST-2 DEPTH 2.0' to 4.5'

CLASSIFICATION ____

READING NUMBER	Q FLOW (ML)	h_o INITIAL HEAD(CM)	$h_o - h_1$ DROP IN HEAD(CM)	h_1 FINAL HEAD(CM)	INITIAL TIME	FINAL TIME	± TIME (SECONDS)	K PERMEABILITY RATE (CM/SEC)
1	2	90.0	1.3	89.9	11:30AM 11/7/85	1.:11PM		
				89.8		2:04PM		
				88.7		11:31AM 11/8/85	86,400	2.4×10^{-8} cm/sec

AREA OF STANDPIPE (CM^2) $a =$ 1.733

LENGTH OF SAMPLE (CM) $L =$ 2.54

AREA OF SAMPLE (CM^2) $A =$ 31.33

WET DENSITY PCF

$$K = \left(\frac{2.3\,a\,L}{A\,t}\right) \log\frac{Ho}{Hi} = 2.4 \times 10^{-8} \text{ cm/sec}$$

ATEC Associates, Inc.
13501 E. Main Street, Griffith, IN 46319 · 219-924-6690 · 312-375-3092
13450 S. Cicero Avenue, Crestwood, IL 60445 · 312-388-0895

PERMEABILITY TEST

CLIENT: Gary Development Sanitary Landfill
Cline Ave. & Gary Ave.
Gary, IN

PROJECT: Soil Borings
Gary Landfill
Gary, IN

FILE No. S-1017
DATE 11/7/85
REPORT No.
SHEET 1 OF 1
TECHNICIAN DG

LAB NO. Con-2 BORING NO. B-3 SAMPLE NO. ST-3 DEPTH 15.0' to 17.5'

CLASSIFICATION

READING NUMBER	Q FLOW (ML)	h_o INITIAL HEAD(CM)	$h_o - h_1$ DROP IN HEAD(CM)	h_1 FINAL HEAD(CM)	INITIAL TIME	FINAL TIME	± TIME (SECONDS)	K PERMEABILITY RATE (CM/SEC)
1	2	90.0	14.8	88.5	11:29AM 11/7/85	1:10PM		
				86.5		3:03PM		
				75.2		11:30AM 11/8/85	86,400	3.0×10^{-7} cm/sec

AREA OF STANDPIPE (CM^2) a =

LENGTH OF SAMPLE (CM) L =

AREA OF SAMPLE (CM^2) A =

WET DENSITY PCF

$$K = \left(\frac{2.3\,a\,L}{A\,t}\right) \text{LOG}\frac{Ho}{Hi} = 3.0 \times 10^{-7} \text{cm/sec}$$

ATEC Associates, Inc.
1501 E. Main Street, Griffith, IN 46319 · 219-924-6690 · 312-375-5092
13450 S. Cicero Avenue, Crestwood, IL 60445 · 312-385-0895

PERMEABILITY TEST

CLIENT	Gary Development Sanitary Landfill Cline & Gary Ave. Gary, IN	PROJECT	Soil Borings Gary Landfill Gary, IN

FILE No. 5-1017
DATE 9/17/85
REPORT No. _____
SHEET _____ OF _____
TECHNICIAN WSG

LAB NO. _____ BORING NO. B-4 SAMPLE NO. ST-4 DEPTH 9.5-11.5'

CLASSIFICATION _____

READING NUMBER	Q FLOW (ML)	h_o INITIAL HEAD(CM)	$h_o - h_1$ DROP IN HEAD(CM)	h_1 FINAL HEAD(CM)	INITIAL TIME	FINAL TIME	± TIME (SECONDS)	K PERMEABILITY RATE (CM/SEC)
1	2	90.0	1.3	88.7	3:09PM 9/17/85	8:06AM 9/18/85	61,140	3.3×10^{-8}

AREA OF STANDPIPE (CM^2) $a = 1.733$

LENGTH OF SAMPLE (CM) $L = 2.54$

AREA OF SAMPLE (CM^2) $A = 31.65$

WET DENSITY PCF

$$K = \left(\frac{2.3\,a\,L}{A\,t}\right) \log \frac{Ho}{Hi} = 3.3 \times 10^{-8} \text{ CM/SEC}$$